



WESTON WAY
WEST CHESTER, PA 19380
PHONE: 215-692-3030
TELEX: 83-5348

December 13, 1989

Rick Roberts
Rocky Flats Plant
Building 250
RCRA Programs
Post Office Box 464
Golden Colorado, 80402-0464

Dear Rick:

Enclosed are our responses to the review comments on the report entitled "Derivation of Target Clean-up Levels for Soils at the Solar Evaporation Ponds." Please call if you have any questions or if I can be of further assistance.

Very truly yours,

ROY F. WESTON, INC.

Isabel Mandelbaum, Ph.D., DABT
Toxicologist/Senior Project Scientist

Responses to Numbered¹ and Handwritten² Comments for DERIVATION OF TARGET CLEAN-UP LEVELS FOR SOILS AT THE SOLAR EVAPORATION PONDS.

General comment (no page #) - All references will be rechecked prior to preparation of the final document.

Comment #1 (no page #) - can't respond at this time.

p. 1-1 and p. 1-2 - "Reverse risk assessment" will be changed to risk-based process" as requested.

Comment #2 (p. 1-2) It might be helpful in Section 1 to emphasize that the approach used in deriving clean-up levels is based on EPA methodology for conducting risk assessments and uses, where possible, EPA derived health-based values. The approach is, therefore, consistent with recommended EPA procedures.

Comment #3 (p. 1-2) - can't respond at this time.

p.1-2 - can't respond at this time to handwritten comment on clean-up vs. capping.

Comment(s) #4 (p. 1-3) - can't respond at this time

¹ Indicated by "Comment # _____ (p.)

² Indicated by page number only.

p. 1-3 -Reviewer needs to clarify what is being requested by a "contamination profile".

Comment #5 (p. 1-4) - It is recognized that the original site contaminants may have undergone degradation. However, it is common practice when characterizing site contamination to assay only for a pre-selected group of chemicals. These chemicals usually include EPA priority pollutants and selected general quality indicators (e.g., sodium, bicarbonate ion). Although, ideally, a risk based process should consider all contaminants that are present, this is not practical. Occasionally, special analyses are requested if, based on site history or other pertinent information, a particular chemical(s) is believed to be of potential concern. The special analyses could include degradation products. However, to routinely assay for degradation products would be costly and impractical.

Comment #6 (pp. 1-4, 4-2) - see response to Comment #5. With the exception of PAHs, only those chemicals which actually have been reported in site-related media samples were evaluated in this report. In general, only known contaminants are taken into consideration in risk-based evaluations.

Although, theoretically, clean-up levels could be determined for degradation products, even in the absence of sampling data, a number of problems could arise. These, include, but are not necessarily limited to:

- o Predicting degradation products for organics could be difficult since they would be dependent on site specific factors.
- o Predicting degradation products for metals would be virtually impossible because the original species are not known (see response to Comment #7).
- o Because the approach to determining clean-up levels

assumes that the toxic effects of all chemicals are additive, assuming the presence of additional chemicals could decrease the clean-up levels for the chemicals which are known to be present to unfeasible concentrations.

Comment #7 (pp. 2-2, 2-4 (and handwritten comments pp. 2-3, 2-6) -

The species of the inorganics are not assayed for in practice and are, therefore, not known. Metals and other inorganics are assayed for as the inorganic per se either as "total" or as "soluble". This will be clarified in the text. This analytical approach is consistent with EPA and other governmental procedures for the analysis of inorganics. To assay for every species of a metal would be impractical.

Based on the analytical results, there is no way of determining the presence of organic complexes or the oxidation state of the metals.

Comment #8 (p. 2-4) - This is not an error. Antimony was not reported above the detection limit in background alluvial soil samples.

p. 2-2 - This report addresses the clean-up of only the nonradioactive contaminants. Radionuclides will, however, eventually be addressed. A paragraph(s) will be added to the text explaining why radionuclides are not evaluated in the report at this time and why the "Don Dunning" memo is included.

Comment #9 (pp. 2-1, 2-3, 2-4) - A complete list of detected chemicals based on all sampled media is presented on Table 2-1, However, the data presented in Table 2-2 are only for the soils surrounding the ponds, including the berms. They do not include sludge, sediments, or groundwater data. The data also do not

reflect the soils beneath the pond, as this information is not available (see reviewer Comment #4).

The data are in the process of being re-evaluated using the upper 95 percent tolerance interval.

p. 2-3 - Bicarbonate and chloride were assayed for as the ion. Calcium, magnesium, potassium, and sodium were assayed for as "total". This will be clarified in the text. "Phosphorus" should be "phosphate ion" . This will be corrected in the text.

p. 2-4 - The concentrations of strontium presented in Table 2-2 are for stable strontium.

The references for the analytical methods can be provided in the text.

Comment #10 (p. 2-6) - The inclusion of iron, sulfate and nitrate was a value judgement. Although relatively nontoxic (compared to heavier metals) iron is potentially more toxic than the chemicals that were eliminated (i.e., calcium, sodium, etc). Both nitrate and sulfate are sufficiently toxic for their toxicity to have been considered in developing Maximum Contaminant Levels (MCLs) for drinking water (primary for nitrate, secondary for sulfate).

It should also be noted that iron (as ferric chloride), nitrate (as sodium nitrate) and sulfate related chemicals (sulfuric acid, ammonium persulfate) were reportedly disposed of in the ponds (p. 1-4), and could conceivably be present at levels of concern on the soil beneath the ponds. The reasons for the inclusion of iron, sulfate, and nitrate, can be added to the text.

Both cyanide and selenium were reported in on-site soils. In the

absence of background data they were conservatively retained as site contaminants since it is possible they might be present above background. Thallium, however, was not detected above detection (i.e., there is no evidence of its presence in on-site soils).

The "nitrate" referred to in Table 2-2 was assayed for as nitrate-nitrite nitrogen. This will be clarified in the text. Ammonia (and other N-compounds) were not included because they were not assayed for in any media samples.

Comment #11 (p. 2-6) - See responses to Comments #5 and #6.

Comment #12 (p. 2-1) - See response to p. 2-2 handwritten comment.

P. 3-1 and page facing p. 3.1 - In the past (i.e., risk assessment for the 881 Hillside) CDH and EPA indicated that they wanted a residential scenario used as the basis of risk evaluation for the Rocky Flats Plant site. Therefore, it was used in this report as well to determine clean-up levels for the solar ponds.

Can't respond to comments regarding the public hearing/focus group or 1989 Tri-Partite Agreement.

Experience in performing risk assessments has indicated that because construction workers are exposed for relatively short periods of time compared with residents, they are not at greater total risk than a lifetime resident. Although farmers could potentially be at greater risk, a farm or ranch scenario has previously been rejected by CDH and EPA as a suitable scenario for the Rocky Flats Plant site (i.e., 881 Hillside risk assessment).

p. 3.2 - Evidence is provided in the discussion that follows.

p. 3.3 - Can't respond at this time.

Comment #13 (p. 3-5) - Can't respond at this time.

Comment #14 (p. 4-1) - There are no apparent sensitive environmental targets (i.e., endangered species, sensitive ecosystems) in the vicinity of the Rocky Flats Plant. Humans are likely the most sensitive population that could be impacted by contaminated soils.

Comment #15 (p. 4.1) - Health criteria were used interchangeably between exposure routes only by default and only after an examination of available pharmacokinetic and toxicity data indicated that it could be justified. Obviously, route specific criteria are preferred and used when available.

p. 4-1 - It is impractical, if not impossible, to consider synergism (or antagonism) or potential chemical reactions between contaminants. The approach used in determining clean-up levels is consistent with the approach currently in use to assess human health risks. The limitations of the risk assessment approach are widely recognized by the government and other risk assessment practitioners. However, the overall process is conservative and, therefore, generally accepted as being health protective (if not overprotective).

Comment #16 (p. 4-2) The reason for EPA's recommendation not to quantitate the carcinogenic potency of lead will be clarified in the text.

Comment #17 (p. 4-2) See responses to Comments #5 and #6.

Comment #18 (p.4-2) There is no way of predicting whether the older potency value is more likely to be higher or lower than a newer (and as yet undeveloped) factor. When a (old) factor is

retracted, the available toxicity data are evaluated and a new criterion is derived based on the weight of evidence.

Comment #19 (p. 4-3) - See responses to preceding comments.

p. 4-6 - The reviewer needs to clarify the comment "ingestion or inhalation".

Comment #20 (p. 4.7) - See response to Comment #18. A new, slightly lower oral RfD has been published for arsenic (i.e., 1.0×10^{-3} mg/kg/day). This, however, will not affect the calculation of a clean-up level for arsenic, which is driven by carcinogenic risk.

p. 4.7 - The examples are given to illustrate what is meant by a noncarcinogenic effect. An RfD should protect against all adverse noncarcinogenic effects. The nature of the potential toxic effects and the most sensitive toxic effect will vary between chemicals.

Comment #21 (p. 4-9) - The 100x uncertainty factor was arrived at by following EPA guidelines. A factor of 10x was assumed to take into account human variability (i.e., extrapolating in this case from a healthy worker to sensitive members of the general population). Another "modifying factor" of 10x takes into account additional uncertainty (e.g., extrapolating from a guideline based on intermittent exposure to a continuous exposure). We believe that the factor of 100x is sufficiently health protective. However, because it is recognized that more conservative factors have been used by governmental agencies and other risk assessment practitioners, the factor will be re-evaluated (also see response to handwritten comment "p. D-1").

p. 4-9 - The words "are commonly used" will be changed to "have been used".

p. 4-10 - The potential consequences of exceeding a reference dose depends on the extent to which the reference is exceeded. An RfD is derived based on the most sensitive known toxic endpoint. A complete toxicity profile would be required to characterize all potential consequences.

Comment #22 (p. 5-1) - "Most conservative" refers to the fact that all 33 contaminants are assumed to be present beneath the solar ponds and, therefore, the clean-up levels calculated for contaminants beneath the ponds are lower than the clean-up levels calculated for contaminants at individual sampling locations around the ponds where fewer contaminants are present. The words "most conservative" will be changed to "lowest calculated". (Note: whether or not this approach is conservative depends on the nature of the contaminants present)'.

Comment #23 - The "additive" approach was developed by USEPA and is the approach that is currently accepted by state and local government agencies. Although the approach can be challenged from an academic perspective, it is highly improbable that it would be challenged by any regulatory agency.

p. 5-2 (and p. 5-16). - "Tabularized" will be changed to "tabulated".

The exposure factors that are referred to in the text do not include the parameters mentioned by the reviewer but include the factors used to calculate the estimated daily intake (i.e., administered dose). This will be clarified in the text. Because carcinogenic potency factors are based on a lifetime exposure, they implicitly take into consideration differences in susceptibility due to age.

pp. 5-3, 5-4, 5-6, 5-9, 5-16 - The potential exposure period,

assumed to be 8 months (32 weeks) will be re-evaluated and modified, if necessary.

pp. 5-4, 5-6, 5-8, 5-9, (and 4-6) - The units for the variables are those that are used in common practice. However, these units can be modified, if requested.

p. 5-4 - The conversion factor will be changed to read "10⁶ kg/mg" (Note: the calculations were carried out correctly - this is a typo only).

Comment #24 (p. 5-6) - As indicated in the response to handwritten comments for p.3-1, CDH and EPA have considered a residential housing development to be an appropriate (and conservative) future land use scenario for the site. The 50 percent consumption rate seems appropriate for that scenario. The 60 percent value reported by USEPA is for farm households which would be expected to consume more home grown vegetables.

p. 5-9 - "See text" will be clarified to "see text section 5.1.2.3".

The exposed surface area is used to determine dosage which is expressed in mg/kg/day. The words "contact event" will be changed to "day".

Page facing p. 5-10 - It is explained in the report both in the text and in the tables when ingestion and inhalation are being considered. It would be helpful in addressing this comment if the reviewer would specifically indicate where in the document it is unclear which exposure route is being considered.

p. 5-10 - The reference to Appendix D will be corrected to read Appendix F.

p. 5-13 - The equation was cited from Rosenblatt et al. The Rosenblatt reference is provided in the text, immediately preceding the equation.

Page facing p. 5-14 - To address the comment regarding the clarity of the calculations the reviewer needs to specify where there is a lack of clarity regarding the methodology. Specific comments regarding the appendices are addressed below.

p. 5-14 - See response to comment on p. 2-2.

p. 5-15 - The reference for the hazard index approach (EPA's Superfund Public Health Evaluation Manual) will be provided in the text.

The last sentence in paragraph 2 will be deleted.

p. 5-16 Please identify which equations, etc. are unclear.

The consequences being considered are chemical specific (See responses to comment "p. 4-10").

Mouthing tendencies include placing foreign objects in the mouth.

p. 5-27 - The spelling of 1,1-dichloroethane will be corrected.

The soil concentration values were calculated using the methodology described in the text.

p. 5-35 - The methodology used in deriving the values in Table 5-18 is presented in Section 5.4.

p. A-1 - The first paragraph will be modified to clarify the

meaning of "p" and "P".

The spacing and grammatical errors will be corrected.

Appendix B - Text will be added to the Appendix to discuss the methodology and to explain the values presented in the tables.

Appendix C, p.2 - For organics, the oral and inhalation RfDs are often similar (i.e., less than an order of magnitude apart), probably because they are well-absorbed into the bloodstream through both the oral and inhalation routes and once in the bloodstream have similar effects. Oral RfDs are used as inhalation RfDs for organics only by default. It was not necessary in this report to use an oral RfD as an inhalation RfD.

p. D-1 - The magnitude of the uncertainty factor that is applied varies, and is dependent on the nature of the data from which it is derived (e.g., animal vs. human data, length of the study). The procedure that was used in applying uncertainty factors follows EPA guidelines.

The uncertainty factor used in Table 4-4 will be re-evaluated (see response to Comment #21).

Sample calculations can be provided. Also, an explanation of the general approaches used to derive RfDs can be presented in an introductory paragraph(s).

p. D-3 - Please clarify what is being requested by "these data should be elaborated on". The sources (i.e., references) of the data are provided in the text.

The results are tabulated (included) in Table 4-5. A separate table listing the oral RfDs derived in Appendix D can be added to

the appendix.

p. F-1 - The calculations presented in Appendix F were carried out in a single step by computer. The intermediate calculations, as presented in the appendix, were never actually done. The appendix attempts to break down the computer model to give the reader an idea of the variables that were used in the model. This needs to be explained in an introductory paragraph.

Site specific meteorological data, if available, will be used to rerun the model.

The code used was ISCLT (Industrial Source Complex Long Term).

p. F-2 - A map of climatic regions 2 and 3 can be provided. F_1 is an unscaled concentration due to a unit erosion rate (i.e., normalized ambient concentration for a unit emission rate). F_1 will be defined in the text.

Please clarify what "certain approximations" refers to and what is being requested by "develop the equations more fully".

Page facing p. F-3 - The breathing rate is $20 \text{ m}^3/\text{day}$, not $20 \text{ mg}/\text{m}^3$ as indicated on p. F-3. This will be corrected. Sample calculations could be done, although as indicated in the response to p. F-1 questions, the calculations were actually carried out in a single step by computer.

p. F-3 - Carcinogenic risk through inhalation can be evaluated using either potency factors expressed in $(\text{mg}/\text{kg}/\text{day})^{-1}$ or unit risk factors expressed in $(\text{ug}/\text{m}^3)^{-1}$. The term "inhalation carcinogenic potency factor" in equation (4) will be changed to read "inhalation carcinogenic unit risk factor ." A table listing the unit risks can be provided in a table in the appendix.

0.83 is an empirical value that has been determined from data from field measurements. This will be clarified in the text.

The erosion potential, as indicated in the text, is the quantity of erodible particles (of a given size) that is available on the surface of the soil. The erosion potential is used to calculate Q_1 , the quantity of particles per time that is actually eroded. The definition of Q_1 , can be clarified in the text.

The potency factors for benzo(a)pyrene were retracted by EPA pending re-evaluation.

p. F-5 - The value of 0.25 was assumed as a conservative estimate of the fraction of the site covered by vegetation, consequently contributing to a conservative estimate of suspended dust concentrations. Because the evaluation is based on a residential housing development scenario, most of the soil would be expected to be covered by buildings, vegetation, or paving. This will be clarified in the text.

Site specific wind data will be used, if available.

p. F-6 - See responses to comments on Section F-1.